

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Jon Opsal et al.

Application No.: NEW

Filed: HEREWITH

For: COMBINATION THERMAL WAVE
AND OPTICAL SPECTROSCOPY
MEASUREMENT SYSTEMS

Group Art Unit: Unknown

Examiner: Unknown

**INFORMATION DISCLOSURE
STATEMENT**121 Spear Street, Suite 290
San Francisco, CA 94105
(415) 512-1312

M/S PATENT APPLICATION

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

Applicant(s) submit(s) herewith patents, publications or other information [attached hereto and listed on the attached Form PTO-1449 (modified)] of which they are aware, which they believe(s) may be material to the examination of this application and in respect of which there may be a duty to disclose in accordance with 37 CFR § 1.56.

This Information Disclosure Statement:

- (a) ☒ accompanies the new patent application submitted herewith. 37 CFR § 1.97(a).
- (b) ☐ is filed within three months after the filing date of the application or within three months after the date of entry of the national stage of a PCT application as set forth in 37 CFR § 1.491.
- (c) ☐ as far as is known to the undersigned, is filed before the mailing date of a first Office Action on the merits, or before a first office action after filing a Request for Continued Examination under §1.114.
- (d) ☐ is filed after the first office action and more than three months after the application's filing date or PCT national stage date of entry filing but, as far as is known to the undersigned, prior to the mailing date of either a final rejection or a

Atty Docket No.: TWI-11220

notice of allowance, whichever occurs first, and is accompanied by either the fee (\$180) set forth in 37 CFR § 1.17(p) or a certification as specified in 37 CFR § 1.97(e), as checked below.

- (e) ☐ is filed after the mailing date of either a final rejection or a notice of allowance, whichever occurred first, and the Issue Fee has not been paid, and is accompanied by the fee (\$130) set forth in 37 CFR § 1.17(i)(1) and a certification as specified in 37 CFR § 1.97(e), as checked below. This document is to be considered as a petition requesting consideration of the information disclosure statement.

[If either of boxes (d) or (e) is checked above, the following "certification" under 37 CFR § 1.97(e) may need to be completed.] The undersigned certifies that:

- (f) ☐ Each item of information contained in the information disclosure statement was cited in a communication mailed from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement.
- (g) ☐ No item of information contained in this information disclosure statement was cited in a communication mailed from a foreign patent office in a counterpart foreign application or, to the knowledge of the undersigned after making reasonable inquiry, was known to any individual designated in 37 CFR § 1.56(c) more than three months prior to the filing of this information disclosure statement.

A list of the patent(s) or publication(s) is set forth on the attached Form PTO-1449 (Modified).

A copy of the items on PTO-1449 (Modified) is supplied herewith, except as noted below.

Those patent(s) or publication(s) which are marked with an asterisk (*) in the attached form PTO-1449 (Modified) are not supplied because they are (a) either U.S. Patents and this an application filed after June 30, 2003, or (b) were previously cited by or submitted to the Office in a prior application no. 10/346,389, filed January 17, 2003, and application no. 09/499,974, filed February 8, 2000 and relied upon in this application for an earlier filing date under 35 U.S.C. § 120.

A concise explanation of relevance of the items listed on form PTO-1449 (Modified) is:

- (k) ☒ not given

- (l) ☐ given for each listed item
- (m) ☐ given for only non-English language listed item(s) [Required]
- (n) ☐ is in the form of an English language copy of a Search Report from a foreign patent office, issued in a counterpart application, which refers to the relevant portions of the references [copy attached].

The Examiner is reminded that a "concise explanation of the relevance" of the submitted items "may be nothing more than identification of the particular figure or paragraph of the patent or publication which has some relation to the claimed invention," MPEP § 609.

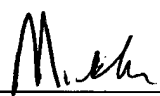
While the information and references disclosed in this Information Disclosure Statement may be "material" pursuant to 37 CFR § 1.56, it is not intended to constitute an admission that any patent, publication or other information referred to therein is "prior art" for this invention unless specifically designated as such.

In accordance with 37 CFR § 1.97(g), the filing of this Information Disclosure Statement shall not be construed to mean that a search has been made or that no other material information as defined in 37 CFR § 1.56(a) exists. It is submitted that the Information Disclosure Statement is in compliance with 37 CFR § 1.98 and MPEP § 609 and the Examiner is respectfully requested to consider the listed references.

Respectfully submitted,

STALLMAN & POLLOCK LLP

Dated: October 21, 2003

By: 
Michael A. Stallman
Reg. No. 29,444

Attorneys for Applicant(s)

INFORMATION DISCLOSURE CITATION <i>(Use several sheets if necessary)</i>	Docket Number (Optional) TWI-11220	Application Number NEW
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U.S. PATENT DOCUMENTS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE
	*AA	4,634,290	01/06/1987	Rosencwaig et al.	374	5	11/14/1985
	*AB	4,636,088	01/13/1987	Rosencwaig et al.	347	5	05/21/1984
	*AC	4,854,710	08/08/1989	Opsal et al.	356	432	07/23/1987
	*AD	4,999,014	03/12/1991	Gold et al.	356	382	05/04/1989
	*AE	5,074,669	12/24/1991	Opsal	356	445	12/12/1989
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	*AK	5,953,446	09/14/1999	Opsal et al.	382	141	10/09/1998
	*AL	5,973,787	10/26/1999	Aspnes et al.	356	369	05/12/1998
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	*AS	6,535,285	08/18/2003	Opsal et al.	356	369	02/08/2000

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	REF	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION	
							YES	NO
	*AT	WO 99/10747	01/14/1999	PCT	G01N	21/17		
	*AU	WO 00/68656	11/16/2000	PCT	G01J	4/00		

OTHER DOCUMENTS

(Including Author, Title, Date, Pertinent Pages, Etc.)

	*AV	M. Fried et al., "Nondestructive determination of damage depth profiles in ion-implanted semiconductors by spectroscopic ellipsometry using different optical models," <i>J. Appl. Phys.</i> , Vol. 71, No. 6, 15 March 1992, pp. 2835-2843.
	*AW	A.P. Webb et al., "Refractive index profiles induced by ion implantation into silica," <i>J. Phys. D: Appl. Phys.</i> , Vol. 9, 1976, pp. 1343-1354.
	*AX	J.R. Adams, "Complex refractive index and phosphorus concentration profiles in P31 ion implanted silicon by ellipsometry and auger electron spectroscopy," <i>Surface Science</i> , Vol. 56, 1976, pp. 307-315.
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	*BA	X-F. He et al., "Disorder effects on optical spectra and band structure of Si induced by ion implantation," <i>J. Appl. Phys.</i> , Vol. 66, No. 11, 1 December 1989, pp. 5261-5266.
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	*BC	Kravetsky, Kulyuk et al., "Reflected optical second harmonic generation as a method for caractereization of ion-implanted, thermal annealed silicon surfaces and silicon-insulator interfaces," <i>Ion Implanted Technology</i> , Vol. 94, 1995, pp. 656-659.

Examiner	Date Considered
Examiner: Initial if citation considered, whether or not citation is in conformance with MPEP Section 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.	

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OTHER DOCUMENTS

(Including Author, Title, Date, Pertinent Pages, Etc.)

	*BD	D.E. Aspnes et al., "Dielectric properties of heavily doped crystalline and amorphous silicon from 1.5 to 6.0 eV," <i>Physical Review B</i> , Vol. 29, No. 2, 15 January 1984, pp. 768-779.
	*BE	Y. Takeda et al., "Large third-order optical nonlinearity of tin microcrystallite-doped silica glass formed by ion implantation," <i>Appl. Phys. Lett.</i> , Vol. 63, No. 25, 20 December 1993, pp. 3420-3422.
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	*BH	Y.Z. Hu et al., "A Comparison of Argon and Hydrogen Ion Etching and Damage in the Si-SiO ₂ System," <i>J. Electrochem. Soc.</i> , Vol. 139, No. 7, July 1992, pp. 2022-2026.
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	*BJ	N.V. Nguyen et al., "Spectroscopic ellipsometry studies of crystalline silicon implanted with carbon ions," <i>J. Appl. Phys.</i> , Vol. 67, No. 8, 15 April 1990, pp. 3555-3559.
	*BK	G.F. Feng et al., "Optical properties of ion-implanted GaAs: The observation of finite-size effects in GaAs microcrystals," <i>Physical Review B</i> , Vol. 40, No. 2, 15 July 1989, pp. 1064-1073.
	*BL	L. Chen et al., "Transient photomodulation spectroscopy of nanocrystalline hydrogenated silicon," <i>Physical Review B</i> , Vol. 39, No. 8, 15 March 1989, pp. 5121-5127.
	*BM	A.H.M. Holtslag et al., "Noble-gas ion bombardment on clean silicon surfaces," <i>Physical Review B</i> , Vol. 38, No. 15, 15 November 1988, pp. 10556-10570.
	*BN	R.E. Hummel et al., "Optical investigations of ion implant damage in silicon," <i>J. Appl. Phys.</i> , Vol. 63, No. 8, 15 April 1988, pp. 2591-2594.
	*BO	J.L. Buckner et al., "Ellipsometric and Rutherford backscattering characterization of low-energy hydrogen-, helium-, neon-, and argon-bombarded silicon," <i>J. Appl. Phys.</i> , Vol. 63, No. 11, 1 June 1988, pp. 5288-5294.
	*BP	J. Narayan et al., "Formation and nondestructive characterization of ion implanted silicon-on-insulator layers," <i>Appl. Phys. Lett.</i> , Vol. 51, No. 5, 3 August 1987, pp. 343-345.
	*BQ	P.J. McMarr et al., "Spectroscopic ellipsometry: A new tool for nondestructive depth profiling and characterization of interfaces," <i>J. Appl. Phys.</i> , Vol. 59, No. 3, 1 February 1986, pp. 694-701.
	*BR	X.C. Mu et al., "Ar ion beam and CCl ₄ reactive ion etching: A comparison of etching damage and of damage passivation by hydrogen," <i>J. Appl. Phys.</i> , Vol. 58, No. 11, 1 December 1985, pp. 4282-4291.
	*BS	R.W. Collins et al., "A ellipsometry study of a hydrogenated amorphous silicon based n-i structure," <i>J. Appl. Phys.</i> , Vol. 57, No. 10, 15 May 1985, pp. 4566-4571.
	*BT	K. Vedam et al., "Nondestructive depth profiling by spectroscopic ellipsometry," <i>Appl. Phys. Lett.</i> , Vol. 47, No. 4, 15 August 1985, pp. 339-341.

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OTHER DOCUMENTS

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	*BU	M. Erman et al., "Analysis of ion-implanted GaAs by Spectroscopic ellipsometry," <i>Surface Science</i> , Vol. 135, 1983, pp. 353-373.
	*BV	J.B. Theeten et al., "Depth profiling and interface analysis using spectroscopic ellipsometry," <i>J. Vac. Sci. Technol.</i> , Vol. 20, No. 3, March 1982, pp. 471-475.
	*BW	J.T. Lue et al., "The wavelength modulation spectrum of ion-implanted silicon," <i>J. Appl. Phys.</i> , Vol. 53, No. 8, August 1982, pp. 5617-5620.
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	*BY	Q. Kim & Y.S. Park, "Ellipsometric investigation of ion-implanted GaAs," <i>Surface Science</i> , Vol. 96, 1980, pp. 307-318.
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	*CA	D.E. Aspnes et al., "An investigation of ion-bombarded and annealed (111) surfaces of Ge by spectroscopic ellipsometry," <i>Surface Science</i> , Vol. 96, 1980, pp. 294-306.
	*CB	V.M. Gusev et al., "Interference method for measuring the effective thickness of ion-implanted layers," <i>Soviet Physics - Semiconductors</i> , Vol. 5, No. 5, November 1971, pp. 737-739.
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	*CE	J.M. Leng et al., "Simultaneous measurement of six layers in a silicon on insulator film stack using spectrophotometry and beam profile reflectometry," <i>J. Appl. Phys.</i> , Vol. 81, No. 8, 15 April 1997, pp. 3570-3578.
	*CF	U Zammit et al., "Optical absorption in ion implanted Si films," <i>Nuclear Instruments and Methods in Physics Research B</i> , Vol. 96, 1995, pp. 241-244.
	*CG	A. Rosencwaig et al., "Thermal wave characterization of semiconductors and superconductors," <i>Review of Progress in Quantitative Nondestructive Evaluation</i> , Vol 8B, 1989, pp. 1195-1201.
	*CH	J. Opsal, "Modulated interference effects and thermal wave monitoring of high-dose ion implantation in semiconductors," <i>Review of Progress in Quantitative Nondestructive Evaluation</i> , Vol 8B, 1989, pp. 1241-1245.
	*CI	J. Bailey et al., "Subsurface defects in silicon investigated by modulated optical reflectance measurements," <i>Review of Progress in Quantitative Nondestructive Evaluation</i> , Vol 8B, 1989, pp. 1263-1271.
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